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Representing: SEIA

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Dr. Butler is a material scientist with training in the structure property relationships of ceramics (earning his bachelors degree in ceramics from Alfred University), metals (having received a masters degree in metallurgy from Rensselaer Polytechnic Institute), and polymers (receiving a Ph.D. in materials science from RPI). He managed the Solar Materials Program at Sandia National Laboratories, Albuquerque, from 1972 to 1978, then went to the Solar Energy Research Institute (SERI), now called National Renewable Energy Laboratory (NREL), from 1978 to 1984, to guide the development of solar thermal technology. Since 1984, he has managed the Solar Energy Products Division for Science Applications International Corporation, which includes management of solar heliostat and dish/Stirling work. He is the past chairman of the Solar Energy Industries Association (SEIA) Solar Unity Network (SUN). He currently chairs the Concentrating Solar Power Division of SEIA. Dr. Butler is the holder of eight issued patents involving solar energy systems. He has earned recognition as a leader in the development of solar energy systems to deliver power that is clean, renewable, reliable, and affordable.

About the Solar Energy Products Division

The Solar Energy Products Division includes research and development of large lightweight optical reflectors including 118-square-meter dishes and 160-square-meter heliostats. The division has significant background in fixed focal length mirror facets up to 3 meters in diameter made of fiberglass and honeycomb structures using metal and composite cores. Research includes reflector materials lamination, optical structures, advanced drives, system controls, and system integration. SAIC is a leader in heliostat and dish/Stirling systems product development.

Testimony to
United States House of Representatives
Committee on Resources
Potential Alternative Energy Sources Available on
National Public Lands
Wednesday, October 3, 2001
Room 1324, Longworth House Office Building

Presented by: Dr. Barry Lynn Butler of the
Solar Energy Industries Association

Thank you Mr. Chairman, Mr. Ranking Member, and members of the committee, for giving me this opportunity to testify. My name is Dr. Barry Butler, and I run the Solar Energy Products Division at Science Applications International Corporation (SAIC), one of the country's largest employee-owned businesses. Today, I am here representing the Solar Energy Industries Association, SEIA, the national trade organization of photovoltaics and solar thermal manufacturers, component suppliers, and national distributors. I have been a member of SEIA for 17 years, including four as Chairman of the Board. I am currently the chairman of the Concentrating Solar Power Division of SEIA.

Summary

Solar power is a domestically produced and controlled, affordable, reliable, and stable electric power resource. Solar power can be generated in large or small amounts, and can be generated in close proximity to where it is needed. This reduces the need for additional transmission line capacity. Its reliability makes it the energy source of choice for numerous remote applications, including on cell phone towers and along fuel pipelines.

For the purpose of this testimony, I am representing all of SEIA's member companies and its affiliated state and regional chapters—more than 500 companies nationwide. The technologies within the term "solar" as I use it are photovoltaics, concentrating photovoltaics, parabolic troughs, power towers, parabolic dishes and zero net energy buildings.

One thousand megawatts of solar power systems are the energy equivalent of 1.2 million barrels of oil per year or a well producing 3,287 barrels per day. To give one example of the large-scale potential for solar, just 10.8 square miles of solar systems on public, private or Indian lands would produce 2,000 megawatts of power.

The federal government is the largest consumer of electricity, and the largest landowner. A program that would drive even a small amount of solar energy generation on federal lands and/or for federal buildings would provide a dramatic boost in production, which in turn would accelerate the reductions in cost and improvements in efficiency that we have consistently seen in solar products over the last 25 years.

Growth in the U.S. solar industry produces numerous benefits, including a cleaner environment, new quality jobs, more energy to help our economy grow, and increased energy independence, which I will touch on further in a moment. On the other hand, without a healthy domestic market, U.S.-based manufacturing will ultimately yield to competitors in Europe and Asia, where governments are actively promoting solar energy deployment. The PV industry worldwide is growing at 25 percent per year today.

The good news is that U.S. Department of Energy solar research programs have helped bring us dramatic advances in solar technology and performance. (And I am not just saying that as an alumnus of our wonderful National Labs.) As Congress finalizes funding levels for fiscal year 2002, and begins to plan for future years, please keep in mind this record of success.

In addition to deploying solar on federal lands and in federal buildings, Congress can take other steps to accelerate solar deployment and reap its benefits. Among these are:

- **Net metering/interconnection standards.** Plugging in your solar power sources should be as easy, and as safe, as plugging in your phone.

- **Tax incentives.** Extension of the Production Tax Credit (PTC) to solar energy enjoys bipartisan support in both houses of Congress, and would help fuel powerful growth for the industry. In addition, a federal 15 percent Residential Solar Energy Tax Credit has already passed the House. Please urge your Senate colleagues to join you in making that provision law this year. Increasing the Investment Tax Credit from 10 percent to 20 percent would also be a useful, and effective, way to encourage businesses to deploy more clean solar energy.

- **Appropriations.** For fiscal year 2002, the Administration originally proposed dramatic cuts in solar and renewable energy research and development programs at DOE. But the White House now supports additional funding. The House-Senate Conference Committee should agree on aggressive funding for solar R&D programs in fiscal year 2002 and beyond. My industry, the CSP industry, stands poised to leverage those DOE research, development, and deployment dollars to get new power generation up and running quickly in the southwestern United States, including California.

- **Solar development bank.** A solar development bank, or revolving loan guarantee, would help the solar industry surmount the high up-front costs that have inhibited faster industry growth. Low interest rate financing would also address this problem.

- **A national solar portfolio standard.** This would help the nation the way similar state efforts have helped those states that have adopted them.

- **Long-term power purchase agreements.** Twenty-year power purchase agreements would help the industry secure the private investment dollars and bank loans needed to grow more quickly. Again, the up-front costs are more substantial for solar than for some other energy sources.

- **Solar schools/reservations/agriculture**. An increased use of solar power in our nation's schools, which would also help our ailing K-12 science programs, and on Indian reservations (remote locations where power lines are prohibitively expensive), would also prove beneficial.

Finally, as our country responds to the tragic events of Tuesday, September 11, we see how our freedom of action is restrained by our need for oil in the Middle East. Certainly, this should remind us that energy independence is a worthy goal for our nation, one that

will not just help our economy but improve our national security. Solar power should play an important role in any effort to reduce our dependence on foreign energy sources.

And before I leave this point, I would like to say as a personal aside that I am just one of the millions of Americans who is proud of how the Congress and the Administration have responded in a united fashion to the terrorist attacks on our nation. Thank you very much. I would be happy to answer your questions.

The benefits of solar development are explained as the five **E's** of solar on national public lands. They are **E**nergy, **E**conomy (employment), **E**xport, **E**nvironment, and **E**mpowerment.

ENERGY is the **first E**. Solar energy can be viewed as an undepletable oil well. One thousand megawatts of solar power systems are the energy equivalent of 1.2 million barrels of oil per year or a well producing 3,287 barrels per day. The land area needed to produce the same amount of electricity as Hoover Dam is shown in figure 1, where 10.8 square miles of solar systems can produce 2,000 megawatts of power on public, or Indian lands. However, a large number of 11-square-mile areas can be developed on public lands and provide a significant fraction of the country's energy requirements, perhaps 20 percent or more over the next 10 years.

In California, the most aggressive state utilizing and striving for clean power, the solar percentage is less than 1 percent. This can be seen in figure 2, which shows where Californians get their electricity. California's electricity generation sources favor solar more heavily than the nation as a whole.

ECONOMY is the **second E**. Deploying 5,000 megawatts by the year 2006 could be accomplished using national public lands, and would be accomplished by using all of the solar technologies at our disposal, which are shown in figure 3. The first is photovoltaics, which turns sunlight into direct current electricity, and can be inverted to AC power for the grid. These systems appear on the left-hand side of the figure for grid tied applications and on the right-hand side as part of solar buildings. The second option is dish/engines, which convert sunlight into heat and then electricity and concentrating photovoltaic systems, which use less solar cell area and a reflecting or refracting solar concentrator. The third option is power towers, which concentrate the solar radiation on a tower-mounted receiver, where the high temperatures can be used to generate steam and drive a conventional turbine producing electricity. The fourth option is parabolic trough technology, which is currently the most utilized of all the solar technologies and produces 354 megawatts in the California desert. The parabolic trough systems have been operating continuously and cost-effectively in the California desert for the last ten years. The fifth option is zero net energy solar buildings. In this case, office buildings and residences can be equipped with photovoltaics, solar domestic hot water, solar industrial heat systems, and/or natural daylighting systems, which reduce their demand for electricity and move them toward energy independence.

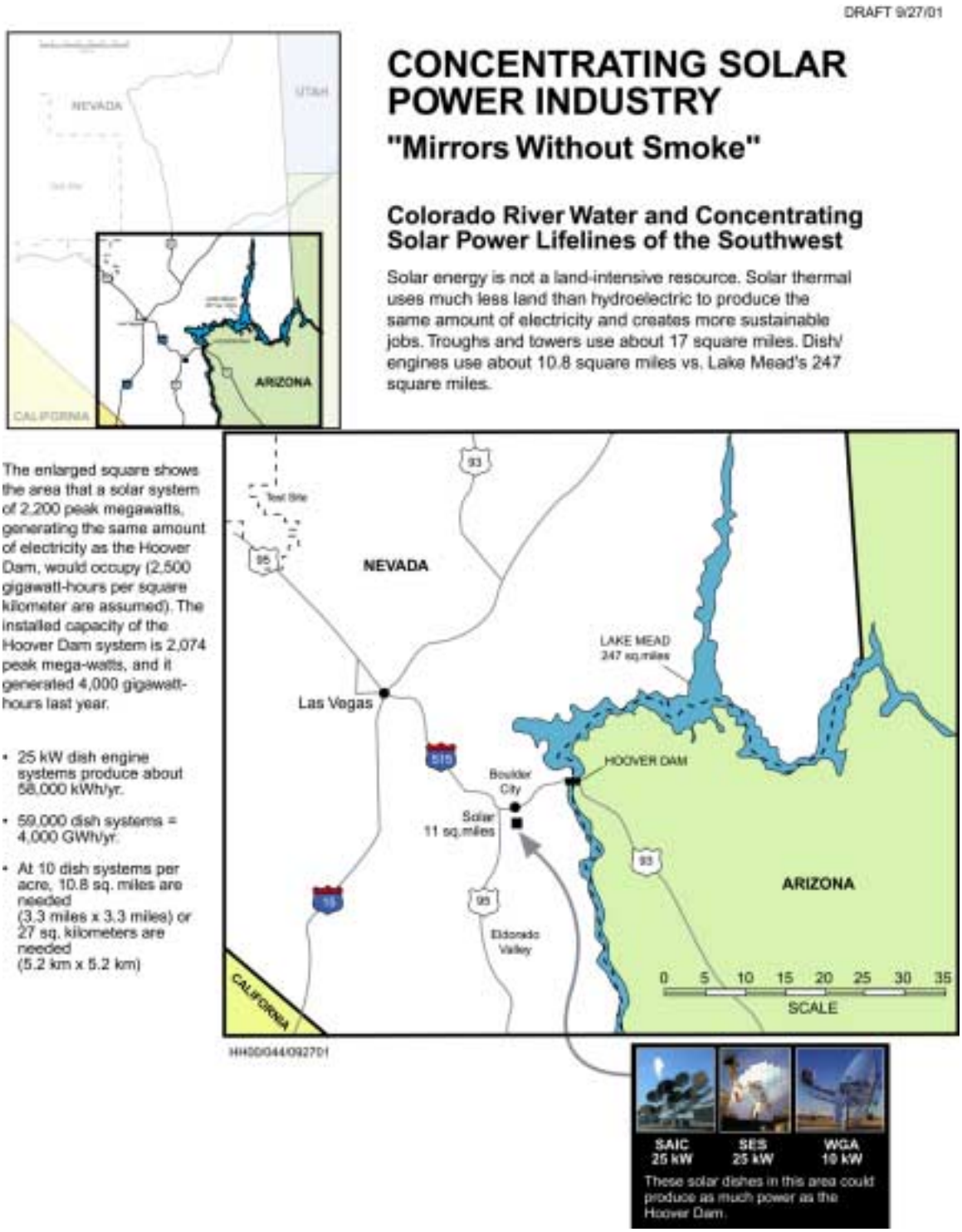

Figure 1. Hoover Dam

CALIFORNIA can have 5% clean solar electricity by 2006, a first step toward energy independence and stable prices. The rest of the nation could follow.

Power Electric Plant Totals*	# of Plants	Capacity (MW)	% of Supply	New Additions Year 2003	New Additions Year 2006
Hydroelectric	386	14,116.53	27%		
Geothermal	46	2,561.70	5%		
Oil/Gas	340	27,733.42	53%	15,324	31,709
Coal	15	549.50	1%		
Wind (Wind Park Areas)	104	1,814.68	3%	100	500
Biomass	38	689.97	1%	100	500
MSW (Municipal Solid Waste)	30	202.09	<1%		
Nuclear	2	4,310.00	8%		
Solar	14	412.63	<1%	250	5,000
GRAND TOTAL:	975	52,390.52			

Higher demand for oil and gas tends to increase price.

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* California Energy Commission data. Plant totals are for operational plants of .1MW and above.

Source: California Energy Commission – Energy Facilities & Environmental Protection Division, Jan. 2001

Figure 2. California Can Have 5% Clean Solar Electricity by 2006

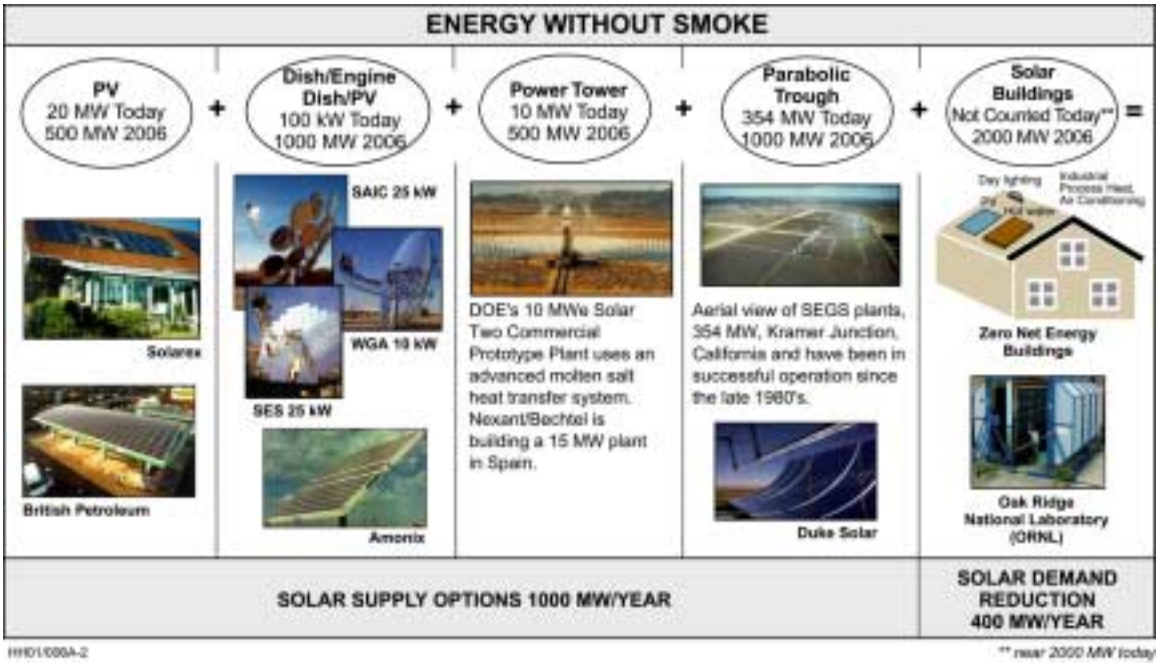

Figure 3. Solar Fuel Price Escalation Resistant Options

Creating 5,000 megawatts of solar power in the Southwest by 2006 would provide 15,000 new jobs, create $1.5 billion in new revenue, and support a 1,000-megawatts-per-year production capacity. This is based on reducing system cost to $2.50 per watt resulting in electricity prices of $0.10 per kilowatt-hour. This analysis is shown in figure 4.

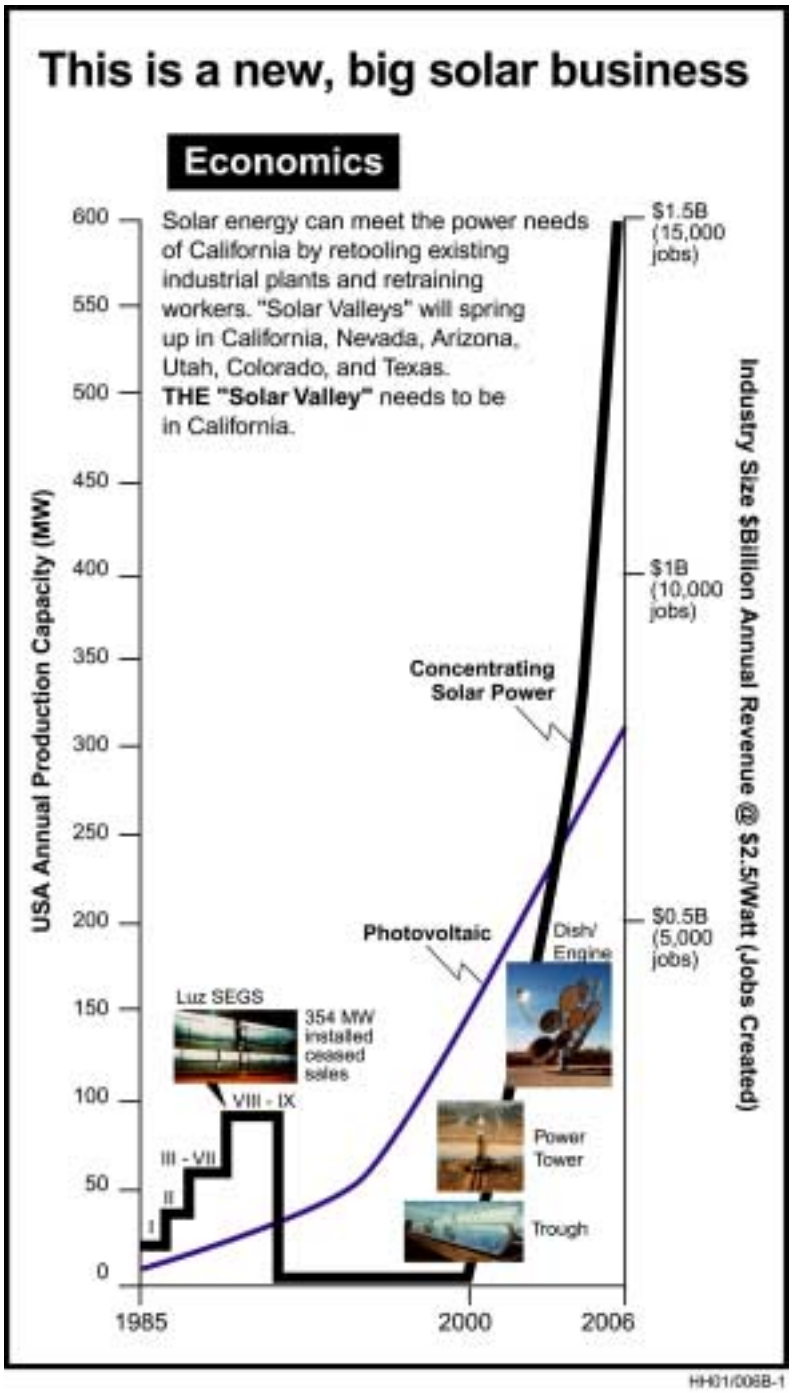

Figure 4. This Is New, Big Solar Business

A very important subset of the economy is employment. The high cost of solar is a result of the fact that it is a manufacturing-intensive business similar to the automobile industry as shown in figure 5. Drilling for oil and gas from reservoirs requires only 1.8 people per million dollars of energy sales, but it takes almost 9.9 people per million dollars of energy sales to make solar systems as shown in figure 6. **We as a nation must decide whether to pay our own citizens to manufacture solar collectors or to send our money offshore to pay for foreign oil**.

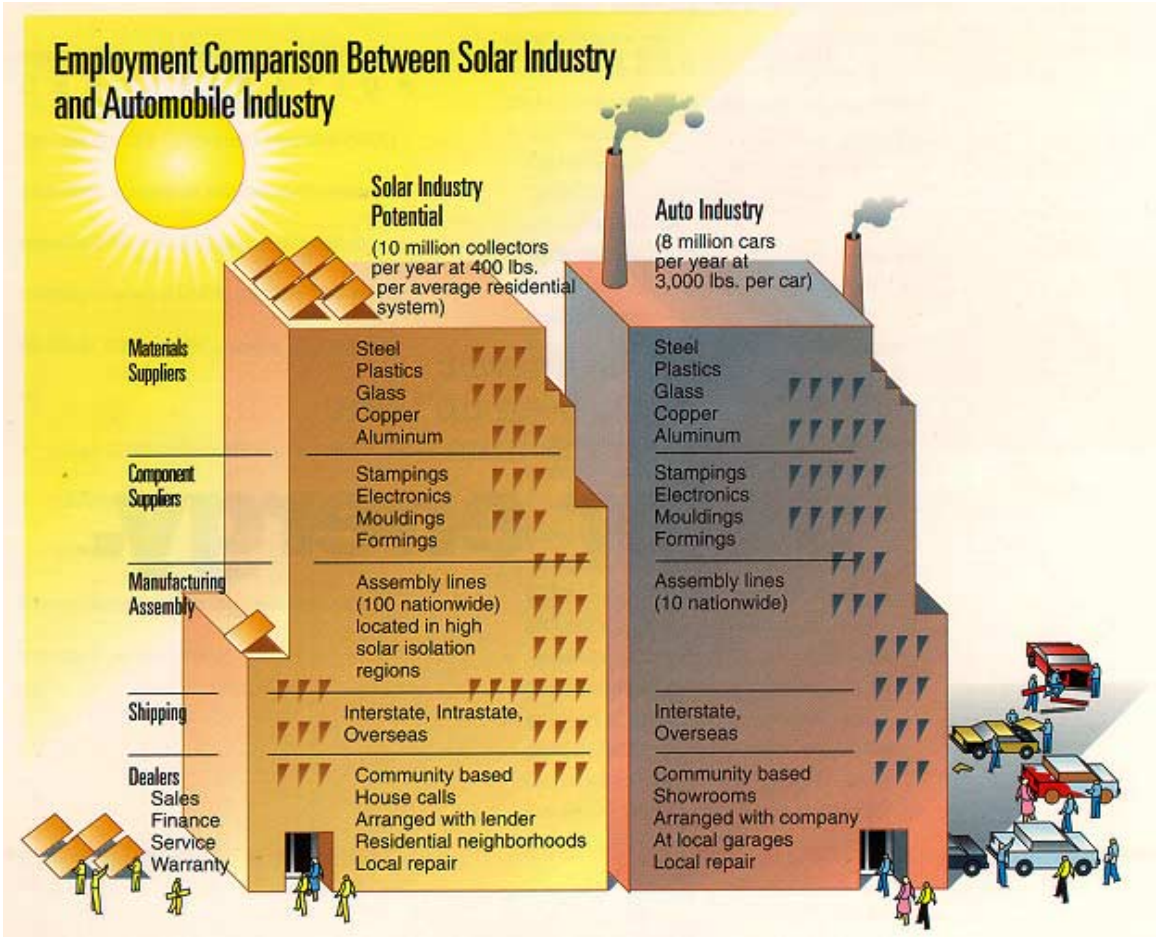

Figure 5. Comparison of Auto and Solar Industries

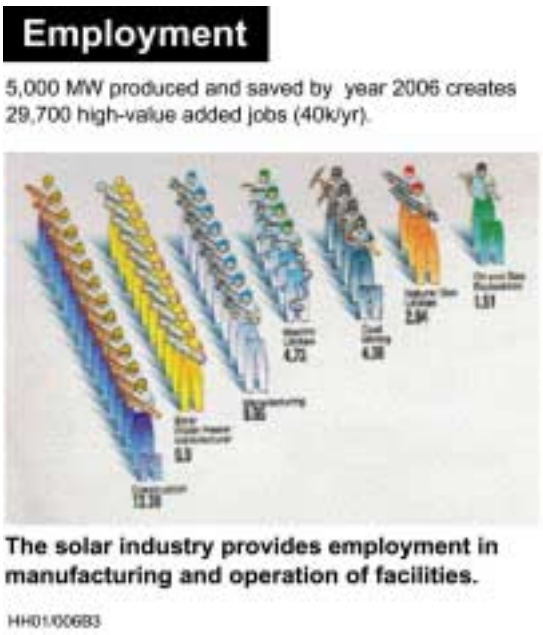

Figure 6. Employment

Manufacturing, installing, and operating solar electric generating systems costs more today than buying foreign and domestic fossil fuels and burning them in power plants. But, how long will this be the case? **Solar collectors use American materials, American technology, American factories, American workers, American transportation, American installation, and American operation—Americans making energy for America.**

EXPORT is the **third E.** Americans manufacturing and selling solar energy technology to the rest of the world is a tremendous export market. At 2 percent growth of the 3 million megawatts, world electricity production will require 60,000 megawatts of new plants per year for the next 10 years. We can export solar electricity-generating technologies to countries all over the globe. The U.S. produces 800,000 or nearly one-third of the world's total. We can increase their electricity production without increasing global pollution. **This increased standard of living based on electricity availability for the rest of the world does not place increased pressure on global fossil fuel reserves and will make the world a more stable and safe place for citizens of all nations.**

This solar program is a partnership between the National Laboratories and the nations industries. The National Labs are working with industry on critical materials and systems that support our industry's next-generation technologies. They will help our solar industry maintain our international lead in technologies we have developed. **International competitors intend to take the solar business away from U.S. companies**.

ENVIRONMENT is the **fourth E.** Solar systems produce no air pollution during operation. Compared to other forms of electricity production, solar is relatively benign as can be seen in figure 7. The benefit of solar energy is that it is available on most of the national public lands, making it an ideal energy option in much of the lower 48 states and the Pacific Islands. The environmental consequences of obtaining raw materials from the earth and fabricating glass, metal, and plastic components for solar collectors are similar to the environmental consequences found in the automobile and semiconductor manufacturing industries. We learned how to manage these environmental consequences in those industries and would manage them similarly in the solar industry. Solar collectors can be easily recycled saving money and materials.

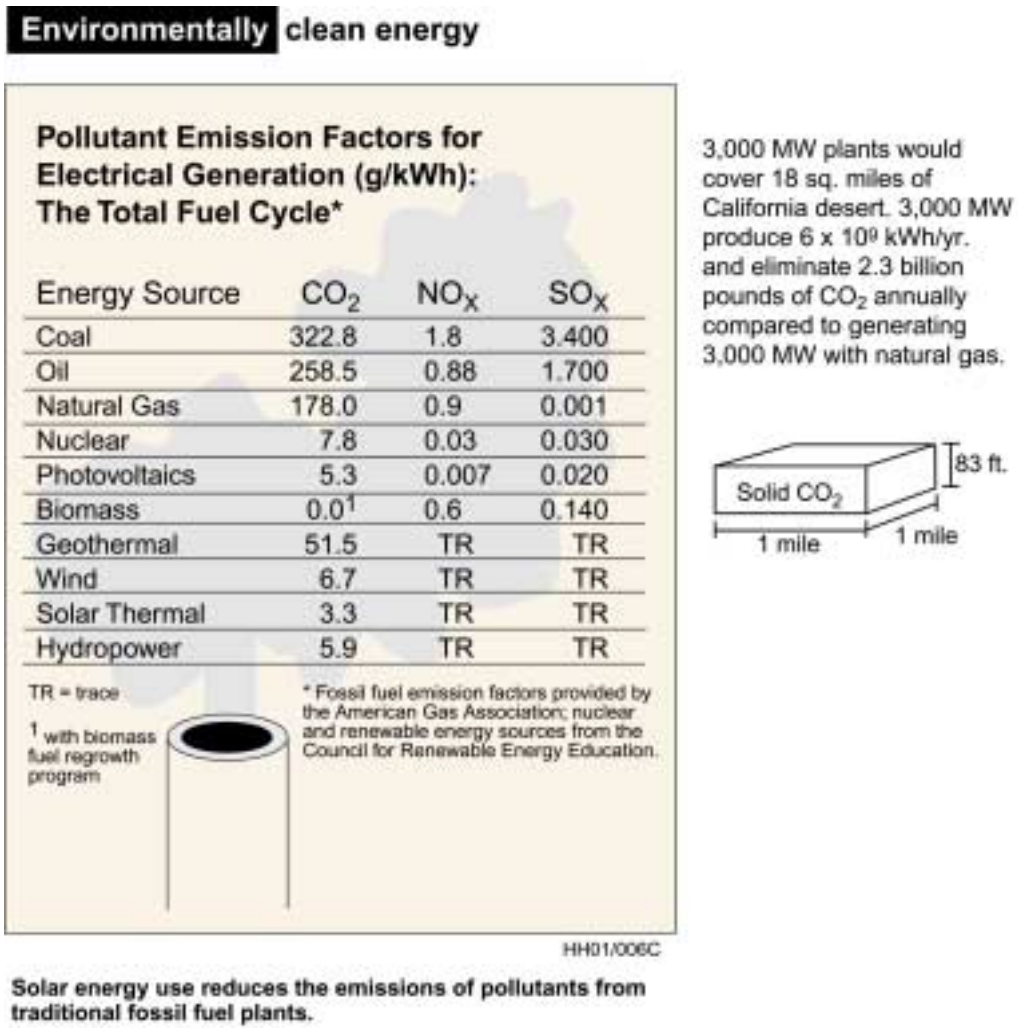

Figure 7. Environmentally Clean Energy

EMPOWERMENT is the **fifth E**. The use of national public lands for solar electricity production could provide us with the national incentive to develop solar resources in this country. Here are a few suggestions as to how this committee of the United States House of Representatives could take positive actions to encourage solar development on national public lands.

Since solar systems purchase "fuel" in the form of a capital cost up front, some additional federal actions to help the solar industry move quickly are:

1) Freedom from federal tax on financial institution income from loans issued for the purpose of constructing a) solar-only installations or b) the solar fraction of solar/fossil hybrids

2) Federal guarantee of loans made by financial institutions for the purpose of constructing a) solar-only installations or b) the solar fraction of solar/fossil hybrids

3) Permission for federal facilities to enter into power purchase agreements for electricity from solar or solar/fossil hybrid plants for periods in excess of 10 years

4) Freedom for project developers or plant owners to utilize state or local incentives, or other existing federal incentives, with any of the foregoing